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OIPE JC161 MAY 03 2004 PATENT & TRADEMARK OFFICE

OIPE JC151 MAY 03 2004 PATENT & TRADEMARK OFFICE

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IFW

PATENT
YR1-15

THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

In re Application of: Lenny Low et al	: Date: April 29, 2004
Serial No. 09/841,373	: Group Art Unit: 3743
Filed: April 24, 2001	: Examiner: N. B. Patel
For: Spacecraft Radiator System and Method Using Cross-Coupled Deployable Thermal Radiators	:

APPEAL BRIEF TRANSMITTAL LETTER

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Enclosed is an Appeal Brief, in triplicate, for the above-identified patent application.

___ Applicant petitions for an extension of time for month(s). If an additional extension of time is required, please consider this a petition therefor.
Fee:

___ An extension for month(s) has already been secured; the fee paid therefore is deducted from the total fee due for the total months of extension now requested.
Extension fee due with this request:

_X_ Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition for extension of time.

___ The Appeal Brief Fee was paid in a prior appeal in which there was no decision on the merits by the Board of Appeals.

_X_ The Appeal Brief Fee is enclosed herewith. Fee: $330.00

_X_ The total fee due is $330.00

_X_ Address all correspondence to Joyce Kosinski, Karambelas & Associates, 655 Deep Valley Drive, Suite 303, Rolling Hills Estates, CA 90274.

This letter is submitted in triplicate.

Respectfully submitted,

Anthony W. Karambelas
Reg. No. 25,657

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OIPE JC151
MAY 0 3 2004
PATENT & TRADEMARK OFFICE

PATENT
Docket No. YR1-15

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Lenny Low et al
SERIAL NUMBER:	09/841,373
FILING DATE:	April 24, 2001
FOR:	Spacecraft Radiator System and Method Using Cross-Coupled Deployable Thermal Radiators
GROUP ART UNIT:	3743
EXAMINER:	N. B. Patel

CERTIFICATE OF MAILING
UNDER 37 CFR 1.8

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Identification of Transmitted Papers

Appeal Brief in triplicate, Appeal Brief Transmittal Letter in triplicate, Check in the Amount of $330.00, return receipt postcard

I hereby certify that the above-identified correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on **April 29, 2004**.

Joyce E. Kosinski
Depositor

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IPE JC161
MAY 03 2004
PATENT & TRADEMARK OFFICE

PATENT
YR1-15

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF APPEALS

Appeal No._____

In re Application of: LENNY LOW ET AL
Serial No.: 09/841,373
Filed: April 24, 2001
For: SPACECRAFT RADIATOR SYSTEM AND METHOD USING CROSS-COUPLED DEPLOYABLE THERMAL RADIATORS

APPELLANTS' BRIEF ON APPEAL

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Anthony W. Karambelas
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF APPEALS

In re Application of: LENNY LOW ET AL	: Date: April 29, 2004
Serial No.: 09/841,373	: Group Art Unit: 3743
Filed: April 24, 2001	: Examiner: N. B. Patel
For: SPACECRAFT RADIATOR SYSTEM AND METHOD USING CROSS-COUPLED DEPLOYABLE THERMAL RADIATORS	:

APPELLANTS' BRIEF ON APPEAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This appeal is taken from the decision of the Examiner in the Office Action dated January 21, 2004 finally rejecting Claims 1-5 in Paper No. 12 of the above-identified patent application. This brief is submitted in accordance with the provisions of 37 C.F.R. §1.192.

REAL PARTY IN INTEREST

The real party in interest is Space Systems/Loral, Inc. which acquired rights to the present application by way of an assignment from the inventors.

RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to appellants, appellants' legal representative, or the assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

Claims 1-5 are currently pending in this application and were finally rejected in the Office Action dated January 21, 2004. Appellants appeal from this final rejection.

STATUS OF AMENDMENTS

With regard to the status of amendments, six Office Actions were issued during prosecution of this application. Claim 5 was amended in response to the first Office

Action dated February 13, 2002. No claims were amended in response to the second Office Action dated June 5, 2002. No claims were amended in response to the third Office Action dated March 19, 2003. No claims were amended in response to the fourth Office Action dated June 3, 2003. No claims were amended in response to the fifth Office Action dated September 9, 2003. No claims were amended in response to the sixth and final Office Action dated January 21, 2004. The claims as they currently stand are presented in the Appendix.

SUMMARY OF INVENTION

In the specification on page 2, line 10 through page 3, line 2 the following Summary of the Invention is presented: The present invention provides for a spacecraft radiator system that thermally couples a north facing payload radiator to a south facing deployable radiator and the south facing payload radiator to the north facing deployable radiator. A spacecraft heat dissipation method is also provided. The north facing payload radiator and the south facing deployable radiator therefore act in tandem and the south facing payload radiator and the north facing deployable radiator also act in tandem to dissipate heat generated on the spacecraft. By cross-coupling the radiators in accordance with the teachings of the present invention, one of the two radiators acting in tandem is always in the shade during solstice seasons. By thermally cross-coupling the radiators, the solar load processed by the radiator system is minimized, thereby increasing the thermal dissipation capability of the radiator system by approximately 15% compared to conventional systems. The present invention comprises a spacecraft having a plurality of payload radiators, which are typically disposed on north and south sides of the spacecraft and a plurality of deployable radiators generally facing north and south. The deployable radiators are thermally coupled to the payload radiators using one or more coupling heat pipes, which are preferably loop heat pipes. Each payload radiator is coupled to the deployable radiator on the opposite side of the spacecraft. For example, the one or more coupling or loop heat pipes for the north deployable radiator are coupled to the south payload radiator and the one or more coupling or loop heat pipes for the south deployable radiator are coupled to the north payload radiator. The prior art has coupled fixed radiators together, and would nearly achieve the same result as the present invention but with significantly lower efficiency and performance. If the deployable radiators were coupled to the payload radiator on the same side of the spacecraft and the payload radiators were thermally coupled, there would be substantially the same improvement in system performance as in the present invention. However, there would be one additional thermal interface compared to

directly coupling the payload and deployable radiators in the manner provided by the present invention. The performance improvement achieved by directly coupling the payload and deployable radiators is roughly 5% compared to 15% using the present invention.

ISSUES

The issues in this appeal are:

Whether claims 1 and 2 are unpatentable under 35 U.S.C. 103(a) over Esposto in view of Yee.

Whether claims 3, 4 and 5 are unpatentable under 35 U.S.C. 103(a) over Esposto in view of Caplin.

GROUPING OF CLAIMS

With regard to the specific grounds of rejection that are in issue, it is respectfully submitted that Claims 1-5 stand or fall together.

DESCRIPTION OF REFERENCES

In U. S. 5,743,325 to Esposto, filed May 22, 1997, issued April 28, 1998, there is disclosed a closed-loop heat pipe transport design for a deployment application having a flexible section which connects to a payload structure and a deployable structure. The flexible section folds over itself while the deployable structure is stowed. Upon rotation of the deployable structure around a predetermined axis, the flexible section unfolds, with a portion of the flexible section passing through the predetermined axis. When the deployable structure has completed its rotation and is fully deployed, the components of the flexible section will lie in substantially the same plane.

In U. S. 6,478,258 to Yee, filed November 21, 2000, issued November 12, 2002, there is disclosed a loop heat pipe cooling system for use on a spacecraft. The loop heat pipe cooling system has loop heat pipes routed from internally facing surfaces of one or more internally located equipment panels to externally located radiator panels. Heat is collected at evaporator ends of each loop heat pipe and transported to condenser ends of the respective loop heat pipe. The condenser ends of the loop heat pipes may either be embedded within the radiator panel or externally mounted and coupled to the radiator panel using a loop heat pipe condensing flange. Fixed conductance heat pipes may also be used in any or all of the internal panels and radiator panels in order to collect and distribute heat loads to and from the loop heat pipes.

In U. S. 5,806,800 to Caplin, filed December 22, 1995, issued September 15, 1998, there is disclosed a dual function deployable radiator and radiator cover for use on a communication satellite. A deployable radiator is folded or in a "stowed" configuration over a fixed radiator when a satellite is in a launch vehicle. The deployable radiator thereby serves as insulation for the satellite when heat rejection is not necessary. When heat rejection becomes necessary, the deployable radiators are deployed whereby unwanted heat is rejected from the satellite. The deployable radiators, therefore serve a dual purpose, functioning as insulators for part of a mission and radiators for the remainder.

ARGUMENT

The Examiner has rejected claims 1 and 2 under 35 U.S.C. 103(a) as being unpatentable over Esposto 5,743,325 in view of Yee 6,478,258.

The Examiner states that Esposto discloses the Appellants' invention as claimed with the exception of providing one or more heat pipes that cross couple opposite facing payload radiators. Further, the Examiner states that Yee discloses a spacecraft multiple loop heat pipe thermal system for internal equipment panel applications that does provide one or more heat pipes that cross couple opposite facing payload radiators (see column 2 lines 25-30). Therefore, according to the Examiner, it would be obvious to modify Esposto's invention by providing one or more heat pipes that cross couple opposite facing payload radiators in order to increase the cooling process.

Appellants respectfully submit that in Esposto '325 there is disclosed "a closed-loop heat pipe transport design for a deployment application having a flexible section which connects to a payload structure and a deployable structure. The flexible section folds over itself while the deployable structure is stowed. Upon rotation of the deployable structure around a predetermined axis, the flexible section unfolds, with a portion of the flexible section passing through the predetermined axis. When the deployable structure has completed its rotation and is fully deployed, the components of the flexible section will lie in substantially the same plane."

As previously noted, Appellants gratefully acknowledge that the Examiner admits that Esposto does not disclose providing one or more heat pipes that cross couple opposite facing payload radiators and is distinguishable from Appellants' instant claims on at least this basis.

Appellants respectfully again submit that in Yee '258 there is disclosed "a loop heat pipe cooling system for use on a spacecraft. The loop heat pipe cooling system

"has loop heat pipes routed from internally facing surfaces of one or more internally located equipment panels to externally located radiator panels. Heat is collected at evaporator ends of each loop heat pipe and transported to condenser ends of the respective loop heat pipe. The condenser ends of the loop heat pipes may either be embedded within the radiator panel or externally mounted and coupled to the radiator panel using a loop heat pipe condensing flange. Fixed conductance heat pipes may also be used in any or all of the internal panels and radiator panels in order to collect and distribute heat loads to and from the loop heat pipes."

Further, in Yee '258 it is stated at column 1, lines 26 et. seq. that "The present invention provides for a loop heat pipe cooling system that provides efficient thermal pathways between spacecraft equipment mounted on any number of internal equipment panels to a combination of multi-directional facing radiator panels. Loop heat pipes employed in the cooling system may be routed from the internal equipment panels to one or more radiator panels in order to optimize spacecraft heat sharing between radiator panels. This improves the overall efficiency of the radiator panels.

"Loop heat pipes are similarly distributed and routed for each of the internally located equipment panels, although this is not an absolute requirement. Heat is collected at evaporator ends of each loop heat pipe and then transported to condenser ends of the loop heat pipes.

"The condenser end of each loop heat pipe may either be embedded within the radiator panel so as to provide a direct condensing loop heat pipe radiator panel or externally mounted to the radiator panel as a loop heat pipe condensing flange. Fixed conductance heat pipes may additionally be used in any or all of the internal panels and radiator panels in order to collect and distribute heat loads to and from the loop heat pipes."

At column 2, lines 25-30 it is stated "The total number of loop heat pipes 11 used in the cooling system 10 depends on the overall heat load. The loop heat pipes 11 are distributed to any number of opposite facing radiator panels 13. For example, one loop heat pipe 11 may be coupled to the north-facing radiator panel 13 and one loop heat pipe 11 may be coupled to the south-facing radiator panel 13."

Appellants respectfully contend that Yee '258 neither teaches, suggests or implies a spacecraft radiator system of the instant invention wherein one or more coupling heat pipes are cross coupled to opposite facing payload and deployable radiators. More significantly, Appellants respectfully contend that Yee '258 nowhere suggests, discloses or implies deployable radiators of any kind, no less a spacecraft radiator system as claimed in the instant invention wherein one or more coupling heat pipes are cross coupled to opposite facing payload and deployable radiators. Such a

teaching is conspicuously absent in both Esposto and Yee and Appellants respectfully submit that it would not be obvious, as the Examiner contends, to modify Esposto's invention by providing one or more heat pipes that cross couple opposite facing payload radiators in order to increase the cooling process as in Yee since Yee clearly does not teach the use of deployable radiators at all nor does Yee teach one or more coupling heat pipes that cross couple opposite facing payload and deployable radiators as in the invention of the instant claims. Such a teaching is conspicuously absent in both Esposto and Yee and Appellants respectfully submit that it would not be obvious, as the Examiner contends, to modify Esposto's invention by providing one or more heat pipes that cross couple opposite facing payload radiators in order to increase the cooling process as in Yee since Yee clearly does not teach or in any way suggest the use of deployable radiators, no less one or more coupling heat pipes that cross couple opposite facing payload and deployable radiators as in the invention of the instant claims.

Furthermore, Appellants respectfully contend that nowhere in Esposto is there any suggestion, as previously recited, that one or more coupling heat pipes may be employed to cross couple opposite facing payload and deployable radiators as in the instant invention.

Appellants respectfully again conclude that Yee '258 does little to cure this deficiency and may not properly be combined with Esposto '325 since Esposto is primarily directed to a closed loop heat pipe transport design for a deployment application having a flexible section which connects to a payload structure and a deployable structure while Yee '258 is directed to a loop heat pipe cooling system routed from internally facing surfaces of one or more internally located equipment panels to externally located radiator panels.

Appellants again respectfully submit that in Yee '258 it is seen that heat is collected at the evaporator ends of each loop heat pipe and transported to condenser ends of the respective loop heat pipe and not to one or more coupling heat pipes that cross couple opposite facing payload and deployable radiators as in the claims of the instant invention.

The Examiner has rejected claims 3, 4, and 5 under 35 U.S.C. 103(a) as being unpatentable over Esposto US Patent No. 5,743,325 as applied to claims 1 and 2 above, and further in view of Caplin US Patent No. 5,806,800. The Examiner goes on to say that Esposto discloses the Appellants' invention as claimed with the exception of providing a body and a plurality of solar arrays.

The Examiner contends that Caplin discloses a dual function deployable radiator cover that does provide a body 12 (see Fig. 1) and a plurality of solar arrays

18 (see Fig. 1). The Examiner therefore concludes it would be obvious to modify Esposto's invention by providing a body and a plurality of solar arrays in order for the invention to function properly.

Appellants again restate the distinctions drawn above with regard to the Esposto reference including, but not limited to, the exception as noted by the Examiner of providing one or more heat pipes that cross couple opposite facing payload radiators, as found in the instant claims which are hereby respectfully incorporated by reference.

Appellants further respectfully submit that in Caplin '800 there is disclosed a dual function deployable radiator and radiator cover for use on a communication satellite. A deployable radiator is folded or in a "stowed" configuration over a fixed radiator when a satellite is in a launch vehicle. The deployable radiator thereby serves as insulation for the satellite when heat rejection is not necessary. When heat rejection becomes necessary, the deployable radiators are deployed whereby unwanted heat is rejected from the satellite. The deployable radiators, therefore serve a dual purpose, functioning as insulators for part of a mission and radiators for the remainder.

As previously pointed out, it can be clearly seen in Figs. 2 and 3 in Caplin '800 the payload radiators are connected to deployable radiators on the same side of the satellite and not on opposite sides of the satellite which does not satisfy the significant limitation of the claims of the instant invention.

Furthermore, at column 3, line 35 et. seq. there is disclosed "There are fixed and deployable radiators on a payload structure 36. Typically, fixed radiators are employed on the sides of the satellite. Up to four deployable radiators may be located on the exterior of the satellite, each connected to the payload structure by (1) a hinge and (2) a means for "transferring heat generated by heat dissipating elements in the payload module to the deployable radiator."

Appellants again respectfully submit that this connection is seen to be a deployable to payload radiator configuration clearly on the same side of the satellite. Further, in Fig. 3 of Caplin '800, Appellants respectfully submit there is an illustration showing deployable radiators 62, 64, 66, 68 in the deployed position; and fixed radiators 70, 72 which are exposed upon deployment of the deployable radiators. Before deployment, the deployable radiators 62, 64, 66, 68 cover the fixed radiators 70, 72 and serve as insulators for the satellite. After deployment, Appellants respectfully submit, the heat rejecting surfaces of the deployable radiators 62, 64, 66, 68 are exposed to space and work to reject unwanted heat from the satellite. The deployable radiators 68, 66 are clearly connected to payload radiators 72 on one side

of the satellite while on the other side of the satellite deployable radiators 62, 64 are connected directly to the payload radiator 70 on the other side of the satellite.

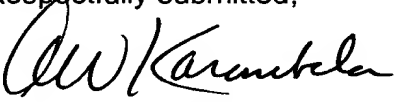
Appellants again respectfully contend that this is clearly distinguishable from the deployable to payload coupling configuration on opposite sides of the satellite as recited in the claims of the instant invention.

Appellants respectfully submit that Esposto '325 does not teach, suggest or imply the novel system of the instant invention and that Yee '258 or Caplin '800 may not be properly combined with Esposto in any manner to render the claims of the instant invention obvious under 35 U.S.C. 103(a).

In view of the above remarks, Appellants respectfully contend that all of the claims presently under prosecution contain patentable subject matter and have been shown to be patentably distinguishable over the prior art of record including Esposto '325 which is directed to a flexible serpentine shaped section in a closed loop heat pipe system to permit a deployable radiator structure to be easily deployed; Yee '258 which nowhere suggests, discloses or implies the use of deployable radiators; Caplin '800 which discloses payload radiators connected to deployable radiators on the same side of the satellite and not on opposite sides of the satellite as required by the instant claims; or any improper combination of Esposto, Yee or Caplin. It is Appellants' position that Esposto, primarily directed to a closed loop heat pipe transport design for a deployment application having a flexible section which connects to a payload structure and a deployable structure, may not be properly combined with Yee, directed to a loop heat pipe cooling system routed from internally facing surfaces of one or more internally located equipment panels to externally located radiator panels with no reference, suggestion or implication of employing deployable radiators. Appellants take the position that the only basis for combining Esposto and Yee as contended by the Examiner is Appellants' own specification and claims as filed.

Accordingly, Appellants respectfully request that the final rejection of the Examiner be reversed and that this application be allowed to go to issue.

Respectfully submitted,



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APPENDIX

Claims 1-5 as presented below are currently pending in this application.

1. A spacecraft radiator system for use on a spacecraft having a body and a plurality of solar arrays, the system comprising:

first and second opposite facing payload radiators;

first and second opposite facing deployable radiators; and

one or more coupling heat pipes that cross couple opposite facing payload and deployable radiators.

2. The spacecraft radiator system recited in Claim 1 wherein the one or more coupling heat pipes comprise loop heat pipes.

3. A spacecraft comprising:

a body;

a plurality of solar arrays;

a spacecraft radiator system comprising:

first and second opposite facing payload radiators;

first and second opposite facing deployable radiators; and

one or more coupling heat pipes that cross couple opposite facing payload and deployable radiators.

4. The spacecraft recited in Claim 3 wherein the one or more coupling heat pipes comprise loop heat pipes.

5. A spacecraft heat dissipation method comprising the steps of:

configuring a spacecraft to have a body, a plurality of solar arrays, first and second opposite facing payload radiators, first and second opposite facing deployable radiators, and loop heat pipes cross coupling opposite facing payload and deployable radiators;

launching the spacecraft into orbit; and

when in orbit, cross coupling heat coupled to a respective payload radiators to an opposite facing deployable radiator.